

CLAIMS

1. A polycrystalline thin film consisting mainly of oxide crystal grains which have a crystal structure of a type C rare earth oxide represented by one of the formulas Y_2O_3 , Sc_2O_3 , Nd_2O_3 , Sm_2O_3 , Eu_2O_3 , Gd_2O_3 , Tb_2O_3 , Dy_2O_3 , Ho_2O_3 , Er_2O_3 , Yb_2O_3 , Lu_2O_3 , and Pm_2O_3 formed on a film forming surface of a polycrystalline substrate, wherein grain boundary inclination angles between corresponding crystal axes of different crystal grains in the polycrystalline thin film along a plane parallel to the film forming surface of the polycrystalline substrate are controlled within 30 degrees.
2. A polycrystalline thin film as claimed in claim 1, wherein said polycrystalline substrate is a heat resistant metal tape made of an Ni alloy and said crystal grains are made of Y_2O_3 .
3. A method of producing a polycrystalline thin film consisting of oxide crystal grains which have a crystal structure of a type C rare earth oxide represented by one of the formulas Y_2O_3 , Sc_2O_3 , Nd_2O_3 , Sm_2O_3 , Eu_2O_3 , Gd_2O_3 , Tb_2O_3 , Dy_2O_3 , Ho_2O_3 , Er_2O_3 , Yb_2O_3 , Lu_2O_3 , and Pm_2O_3 being on a film forming surface of a polycrystalline substrate, with grain boundary inclination angles between corresponding crystal axes of different crystal grains along a plane parallel to the film forming surface of the polycrystalline substrate being controlled within 30 degrees, wherein the

polycrystalline substrate is set to a temperature in a range from 200 to 400°C and an ion beam of Kr⁺ or Xe⁺ ions or a combined beam of these ions is generated from an ion source with the energy of the ion beam being set in a range from 100 eV to 300 eV, while an incident angle of the ion beam irradiating the film forming surface of the polycrystalline substrate is set in a range from 50 to 60 degrees from the normal direction of the film forming surface of the polycrystalline substrate when depositing particles generated from a target, which is made of the same elements as those of the polycrystalline thin film, onto the polycrystalline substrate.

4. An oxide superconductor element comprising a polycrystalline substrate, a polycrystalline thin film formed on a film forming surface of the polycrystalline substrate, and an oxide superconducting layer formed on the polycrystalline thin film, wherein the polycrystalline thin film consists of oxide crystal grains which have a crystal structure of a type C rare earth oxide represented by one of the formulas Y₂O₃, Sc₂O₃, Nd₂O₃, Sm₂O₃, Eu₂O₃, Gd₂O₃, Tb₂O₃, Dy₂O₃, Ho₂O₃, Er₂O₃, Yb₂O₃, Lu₂O₃, and Pm₂O₃, and grain boundary inclination angles between corresponding crystal axes of different crystal grains along a plane parallel to the film forming surface of the polycrystalline substrate are controlled within 30 degrees.

5. An oxide superconductor element as claimed in claim 4, wherein said polycrystalline substrate is a metal tape.

6. A method of producing an oxide superconductor element comprising a polycrystalline substrate, a polycrystalline thin film formed on a film forming surface of the polycrystalline substrate, and any oxide superconducting layer formed on the polycrystalline thin film, with the polycrystalline thin film consisting of oxide crystal grains which have a crystal structure of a type C rare earth oxide represented by one of the formulas Y_2O_3 , Sc_2O_3 , Nd_2O_3 , Sm_2O_3 , Eu_2O_3 , Gd_2O_3 , Tb_2O_3 , Dy_2O_3 , Ho_2O_3 , Er_2O_3 , Yb_2O_3 , Lu_2O_3 , and Pm_2O_3 , and grain boundary inclination angles between corresponding crystal axes of different crystal grains along a plane parallel to a film forming surface of the polycrystalline substrate being controlled within 30 degrees, wherein the polycrystalline substrate is set to a temperature in a range from 200 to 400°C and an ion beam of Kr^+ or Xe^+ ions or a combined beam of these ions is generated from an ion source with the energy of the ion beam being set in a range from 100 eV to 300 eV, while an incident angle of the ion beam irradiating the film forming surface of the polycrystalline substrate is set in a range from 50 to 60 degrees from the normal direction of the film forming surface of the polycrystalline substrate when depositing particles generated from a target made of the same elements as those of the polycrystalline thin film onto the polycrystalline substrate, and

then the oxide superconducting layer is formed on the polycrystalline thin film.